

Do Gender, Poverty Status and Moisture Stress Affect Wheat Yield? Demonstration Results from Sire, Dodota, Ziway Dugda, and Negele Arsi Districts of Ethiopia

Abdi Etafa^{1*} Degefu Kebede² Kisi Wakweya² Ayalneh Tilahun² Abebe Diriba²
1.International Livestock Research Institute, Addis Ababa, Ethiopia
2.Arsi University, BENEFIT-REALISE Project, Asella, Ethiopia

Abstract

Wheat is an important staple crop in Ethiopia, it is produced in both highland and low land or under high moisture and moisture stress areas of Ethiopia. However, farmers' lack of knowledge about appropriate and recommended practice is among the bottlenecks identified in food insecure and moisture stress areas. This demonstration project is initiated in response to finding appropriate, profitable wheat technology and evaluate improved production practice along farmers' practice in moisture stress areas of East Shoa, Arsi and West Arsi zones. It used two improved varieties along with local variety. Research recommendation on an area of 0.25 for each variety is used. A total of 48 farmers of which 30% Women and 20% NPSNP and 80% farmers are used for the experiment. Accordingly, average yield of kingbird is 33.8 quintal while that of Ogolcho is 32.8 quintals. The study result indicates that both men and women either, the poor or non-poor will harvest and achieve better yield if equally technically supported and accessed to technology. Due consideration to appropriate extension advisory service would enhance yield performance of both men and women and poor and non-poor households. It would be great if future, intervention enhanced availability of appropriate technology that addresses women and men interest. Frontline extension and advisory service providers should be considerate of pertinent issues so that both men and women, PSNP and NPSNP would benefit. Further, strengthening stakeholder partnership with research and development partners network and establishing feedback mechanism has of paramount importance. The use of meteorological information would also be important.

Keywords: NPSNP⁵⁷, PSNP⁵⁸, demonstration, Gender, poor and non-poor, food insecurity

DOI: 10.7176/JPID/56-04

Publication date: November 30th 2020

1. Background and Justification

Ethiopia is the second largest wheat producing country in Africa next to South Africa. Wheat is mainly grown in the central and south eastern highlands during the main (Meher) rainy season (June to September) and harvested in October-November. Wheat yields in Ethiopia lagged other major producers in Africa. From 2004 to 2011, the average yield in Ethiopia was 1.68 tons per hectare. This was about 32 and 39 percent below the Kenyan and South African averages, respectively (Tefera, 2013, Niguse et al, 2015). Arsi, Bale, and parts of Shoa are considered the belt growing area. Bread wheat is the major variety of wheat grown in Ethiopia. Around 5-10% of wheat in Ethiopia is produced in the state farms, the remaining 90-95% are produced by the small-scale farms (Bezabih et al, 2015; Tefera, 2012). Oromia, Amhara and SNNPR regions produce 59%, 28% and 10% of the country's wheat, production respectively (Tefera, 2013; Niguse *et al.*, 2015). There are potentials of wheat production under moisture stress areas of Ethiopia and farmers still practice the production. The major problem faced is, lack of appropriate technology resulting in subsequent and frequent crop failure.

Different governmental and non-governmental research organizations conducted intensive research and developed several rust resistant wheat varieties but mostly recommended to highland, and areas with adequate moisture despite some varieties for moisture stress areas. However, low moisture/moisture stressed areas lack access (even do not know) to adaptable variety and haphazardly use variety they got but linking farmers access to available appropriate improved variety reduces crop failure, increases yield and creates better opportunity to sustain food security. Further, the wheat consumption trend in Ethiopia is gradually increasing in urban areas due to high population growth (about 2.6 percent a year), migration of people to urban areas, and changes in lifestyles (Tefera, 2013). Consequently, the Production fell short of domestic consumption requirements and the country remained a net importer of wheat. Due to the unbalanced demand and supply, wheat demand has significantly risen in the last couple of years at domestic market and the commodity has been commercially imported (Minot et al, 2015). Further, the PRA study result shows that wheat and maize are the major focus crop that the food insecure moisture stressed areas grow. Due to lack of appropriate technology it was observed that continuous production failure is usual business. Observing is bottleneck, increasing the food insecure HHs access to appropriate wheat technology that respond to moisture shortage and disease will add value to the goal

⁵⁷ Non beneficiaries of productive safety net

⁵⁸ Productive safety net beneficiaries

of reducing months of food shortage through improving production and productivity. Therefore, this activity was initiated with the objective of demonstration and promotion of wheat technologies that are recommended and mostly preferred by farmers in the intervention area.

Objective

- To demonstrate improved bread wheat and evaluate productivity and profitability in the study area
- To facilitate the sustained availability and utilization of improved bread wheat in the area
- To improve the improved wheat system innovation through enhancing farmers' role in wheat production.

2. Research Methodology

2.1. Description of the study area

Sire, Dodota and Ziway Dugda are the three-district found in Arsi zone. All the three districts are known for moisture stress and potential for wheat production. Similarly, Negelle Arsi, is a district found in west arsi zone, on the way of Shashemene to Addis Ababa. All the four district is known to be found in the rift valley.

2.2. Materials used

Drought tolerant wheat variety is identified. Accordingly, Ogolcho, and kingbird was used for the purpose of demonstration. All Agronomic input was used as per the recommended package. Among inputs used, NPS_B, UREA, herbicide and fungicide was applied as per the recommendation.

2.3. Site Selection and Research Design

The study was conducted in Negelle Arsi, Sire, Ziway Dugda, and Dodota districts. One intervention kebele from each district with total of 4 (four) kebele was addressed. Within each kebele A total of 12 farmers were used as demonstration hosting farmer. Among the twelve host farmers in each kebele 30% (four) female farmers are intentionally considered. The demonstration was conducted as a support project to food insecure household, so that among the total targeted farmers 80% were PSNP-4 (productive safety-net program-4 beneficiary) farmers at each kebele whereas, 20% were non-beneficiary. For the demonstration purpose Plot size of 0.25 ha of land was used for single variety. A total of 0.75 ha of land was used to lay the two-variety side by side along with local check. Fertilizer at recommended rate of 100kg/ha NPS at planting time and 100kg/ha UREA after 15 days of planting as side dressing was used. All agronomic and yield data was received from an area of 2m*2m with quadrant for the purpose of estimation. Frequent monitoring and follow up was done during the experimentation. All the collected data is analyzed through Excel, and descriptive statistics.

3. Result and discussion

3.1. Adaptability and General characteristics of Varieties used in demonstration

As depicted in the table generally the two varieties used for the demonstration purpose was developed for moisture stress area and is with in the agroecological range of the research and demonstration sites. It matures from 90-102 days, require of rain of 400-800 mm. Adaptable to varied altitude which includes the elevation range of the demonstration sites.

Table:1 general characteristics of wheat variety under demonstration

Variety name	Days to maturity	Rainfall (mm)	Altitude (m.a.sl)	Potential yield in qt.
Ogolcho	102	400-500	1600-2100	33-50
Kingbird	90	500-800	1500-2200	33-52

Ogolcho and King bird varieties used for the demonstration purpose were released for moisture stress areas and thus, fits to the agroecological range of the research and demonstration sites.

Days to maturity for Ogolcho and King bird are 90 and 102 days respectively. Yielding potentials of the varieties at research station ranges from 33 – 50 quintals and 33 – 52 quintal per hectare for Ogolcho and King bird respectively. The average yield of Ogolcho at demonstration site was 32.8 quintals per ha while that of Kingbird was 33.8 quintal per ha. Both varieties were found superior to the local check. In Sire, Ziway Dugda and Dodota woredas, yield performance of both varieties under women PSNP farmers were higher than men PSNP farmers. Conversely, the result was the other way around for Non PSNP farmers in that order. The findings under Nagelle Arsi woreda however showed that men's field yield performance was higher than women's under PSNP farmers while it was higher for women under Non PSNP farmers (table 2).

Table 2: Wheat demonstration yield data result by gender and food security status

Treatment	Sire district				Dodota District			
	PSNP		NPSNP		PSNP		NPSNP	
	women	Men	women	Men	women	Men	women	Men
Ogolcho	51.25	34.5	20.4	52	34	33.3	20.4	36
Kingbird	48.75	36.5	24	44	26	24.0	24	30
Local	29	21.5	16	32	20	14.7	16	16
Treatment	Ziway Dugda district				N/Arsi District			
	PSNP		NPSNP		PSNP		NPSNP	
	women	Men	women	Men	women	Men	women	Men
Ogolcho	43.75	20	37.5	37.5	52.5	55	45	37.5
Kingbird	43.75	17.5	38.75	22.5	40	50	40	31.25
Local	42.5	20	35	27.5	25	37.5	35	26.15

Average yield for Ogolcho, King bird, and local were 32.8, 33.8, and 25.8 Quintals per hectare respectively

Compared to the national and regional CSA (2018) average yield recorded for wheat (27 and 30 quintals per hectare respectively), the average result obtained under the demonstration had shown the yield advantage of 22% and 12% respectively.

3.2. Farmers preferences

Farmers preference evaluation was carried out during frequent field supervision, field day, and during acceptability scoring by host farmers indicated their interest and preference towards Ogolcho, regardless of the yield advantage of Kingbird. The reason for this was the variety has good seed weight, larger number of seeds per spike, and highly preferred seed size and color. In addition, the less preferability of Kingbird regardless of its early maturing nature, its relative shattering property, and very tiny seed size made it less preferable.

Table 3: Farmers Preference (Acceptability score) conducted under selected woredas

Treatment	Sire District (n=5)	N/Arsi District (n=5)
Ogolcho	100	93.3
King Bird	66.7	73.3
Local	33.3	33.3

3.3. Stakeholders feedback

In addition to the farmers preference analysis, stakeholders feed backs were collected on the two improved wheat varieties and variety used as a local control. The stakeholders feedback showed that coupled with adequate supply of seed and necessary input at the right time, the promotion of both improved wheat varieties would result in better yield and contributes to household food security.

Table 4: Stakeholders feedback

Key stakeholder	Stakeholders feedback	Issue that need further improvement
Farmers	Promote to scaling up	Early input delivery, either of variety based on the metrological information, if rain starts on time, we need Ogolcho, when rain onset is late kingbird is adequate. The adequate amount use of input is very important for yield, it is important if there is a means to access credit so that we use package. Wheat row planting requires high number of labors, which is not available at planting time, any technology that reduce labor requirement
Extension (WoA)	Promote	Clustering, is very important, we must work on adequate and timely input delivery
PSNP Office	Promote	Clustering based outreach in all area is appropriate method to follow

The project and the extension part should think from now on effective use meteorological forecast for appropriate seed selection for the area. The other way, for ease of management supervision, market facility and impact clustered production should be focused so that better capacity will be obtained. Community based marketing systems should also be thought once people are starting to produce more. The most important issue in wheat production is, row planting of wheat with local material is a labor-intensive, which is critically short at main planting season and harvesting cost with combiner harvester for which brokers make cost of harvesting per quintal very expensive. Better can be gained if research and development organizations work on how to solve and improve pre- and post-harvest aspects through intermediate pre harvest and post-harvest technology demonstration and promotion.

3.4. Economic analysis

Profitability analysis using partial budget analysis was undertaken. Costs captured as varying cost (variable costs) include cost of land preparation, weeding, seed, fertilizer, chemical, and cost of harvesting, while revenue were computed using quantity of produce and market price. Accordingly, the improved varieties in all locations demonstrated superior to the local check differently (Table 5).

Table 5: Production and profitability analysis

District	Treatment	PSNP			NPSNP		
		Revenue (ETB)	TVC (ETB)	Profit (ETB)	Revenue (ETB)	TVC (ETB)	Profit (ETB)
Sire	Ogolcho	45,417	18,511	26,906	45,250	18,458	26,792
	King bird	48,521	18,977	29,544	42,500	18,509	23,991
	Local	28,038	18,005	10,033	30,000	12,920	17,080
Dodota	Ogolcho	45,360	16,760	28,600	48,600	17,000	31,600
	King bird	33,480	16,129	17,351	40,500	16,649	23,851
	Local	22,680	10,261	12,419	21,600	9,360	12,240
Ziway	Ogolcho	50,167	17,157	33,010	52,500	17,217	35,283
Dugda	King bird	49,000	17,322	31,678	46,667	17,049	29,618
	Local	49,000	12,790	36,210	45,500	18,293	27,207
N/Arsi	Ogolcho	75,250	19,438	55,813	56,000	18,267	37,733
	King bird	63,000	18,899	44,101	47,833	17,991	29,843
	Local	43,750	17,423	26,328	40,740	16,079	24,661
Average	Ogolcho	54,048.50	17,966.50	36,082.25	50,587.50	17,735.50	32,852
	King bird	48,500.25	17,831.75	30,668.50	44,375.00	17,549.50	26,825.75
	Local	35,867.00	14,619.75	21,247.50	34,460.00	14,163.00	20,297

The highest yield and profit were obtained at Negele Arsi for both PSNP and NPSNP beneficiaries for both Ogolcho and king bird. Overall, as indicated in the table above, the use of improved production packages and improved variety in the drought prone area will result in better production and profit thereby contributing to household food and income security.

4. Conclusion and Recommendation

Improving production and productivity of wheat technology is a matter of delivering appropriate technology at appropriate time. It has been learnt that careful selection of technology package along with early preparation is necessary for the areas with rainfall uncertainty.

Kingbird is the most productive variety in the area, followed by Ogolcho. Irrespective of its productivity farmers preferred ogolcho. This is mainly due to several related factors, among which, ogolcho has good taste quality, seed size and better seed color. Farmers also put a pre-condition on the decision of extensive use of either Ogolcho or Kingbird for production. Based on the discussion made with farmers the use of either of the variety based on the response farming to agrometeorological forecast is necessary. When there is a forecast of adequate and enough moisture promoting ogolcho will result in better yield and farmers satisfaction and when there is no adequate or enough moisture targeting kingbird results in better result of intervention. The Wereda and project team should work on providing and advising farmers with adequate meteorological information and delivery of appropriate technology.

The use of package of technology would result in better yield and profitability. Improving farmers access to improved technology and extension advisory service would better result enhanced knowledge, skill and attitude of poor and non-poor men and women farmers, thereby contribute to food self-sufficiency.

Attention should be given to Early input delivery specially improved variety, based on the meteorological information. For instance, for late start of rainfall kingbird better and when rainfall is on time Ogolcho is appropriate.

Extensive awareness creation and promotion on the use of adequate amount of input (seed and fertilizer) is very important for yield. further, enhanced used of the recommended quantity of input requires facilitating input credit service. Wheat row planting requires high number of labors, which is at short during planting time, mechanized row planter farm implement would be a solution with due attention to its careful diagnosis of unintended effect on gender role to reduce labor required.

Reference

- Bezabeh, E. Haregewoin, T. Hailegiorgis, D. Daniel F. and Belay B. 2015. Change and growth rate analysis in area, yield and production of wheat in Ethiopia. *Research Journal of Agriculture and Environmental Management*. Vol. 4(4). Available online at <http://www.apexjournal.org>.
- Tefera, A. 2013. GAIN (Global Agricultural Information Network): Ethiopia Grain and Feed Annual Report.

- Report number ET-1301.
- Tefera, A. 2012. GAIN (Global Agricultural Information Network): Ethiopia Grain and Feed Annual Report. Report number ET-1201.
- Minot, N., Warner, J. Lemma, S. Kasa, L. Gashaw, A. Rashid S. 2015. *The Wheat Supply Chain in Ethiopia: Patterns, trends, and policy options*, IFPRI, Washington DC.
- Nigussie A., Kedir A., Adisu A., Belay G., Gebrie D. and Desalegn K. (2015). Bread Wheat Production in Small Scale Irrigation Users Agro-Pastoral Households in Ethiopia: Case of Afar and Oromia Regional State. *Journal of Development and Agricultural Economics*, Vol. 7(4), pp. 123-130.